

What is claimed is:

1. A detoxified pneumococcal neuraminidase or an antigenic portion thereof.
2. A detoxified pneumococcal neuraminidase or an antigenic portion thereof, wherein the neuraminidase has approximately 60% of the activity of non-detoxified neuraminidase.
3. A detoxified pneumococcal neuraminidase or an antigenic portion thereof, wherein the neuraminidase has approximately 70% of the activity of non-detoxified neuraminidase.
4. A detoxified pneumococcal neuraminidase or an antigenic portion thereof, wherein the neuraminidase has approximately 80% of the activity of non-detoxified neuraminidase.
5. A detoxified pneumococcal neuraminidase or an antigenic portion thereof, wherein the neuraminidase has approximately 90% of the activity of non-detoxified neuraminidase.
6. A detoxified pneumococcal neuraminidase or an antigenic portion thereof, wherein the neuraminidase comprises deletion of at least 7% of the naturally occurring amino acids of non-detoxified neuraminidase.
7. A detoxified pneumococcal neuraminidase or an antigenic portion thereof, wherein the neuraminidase comprises deletion of at least 7% of the naturally occurring amino acids of non-detoxified neuraminidase and exhibits approximately 60% of the activity of non-detoxified neuraminidase.
8. A detoxified pneumococcal neuraminidase or an antigenic portion thereof, wherein the neuraminidase comprises deletion of at least 7% of the naturally occurring amino acids of non-detoxified neuraminidase and exhibits approximately 70% of the activity of non-detoxified neuraminidase.
9. A detoxified pneumococcal neuraminidase or an antigenic portion thereof, wherein the neuraminidase comprises deletion of at least 7% of the naturally occurring amino acids of non-detoxified neuraminidase and exhibits approximately 80% of the activity of non-detoxified neuraminidase.

10. A detoxified pneumococcal neuraminidase or an antigenic portion thereof, wherein the neuraminidase comprises deletion of at least 7% of the naturally occurring amino acids of non-detoxified neuraminidase and exhibits approximately 90% of the activity of non-detoxified neuraminidase.
11. A detoxified pneumococcal neuraminidase or an antigenic portion thereof, wherein the neuraminidase comprises a deletion of at least 5 N-terminal amino acids of non-detoxified neuraminidase.
12. A detoxified pneumococcal neuraminidase or an antigenic portion thereof, wherein the neuraminidase comprises a deletion of at least 10 N-terminal amino acids of non-detoxified neuraminidase.
13. A detoxified pneumococcal neuraminidase or an antigenic portion thereof, wherein the neuraminidase comprises a deletion of at least 15 N-terminal amino acids of non-detoxified neuraminidase.
14. A detoxified pneumococcal neuraminidase or an antigenic portion thereof, wherein the neuraminidase comprises a deletion of at least 10% of the C-terminal amino acids of non-detoxified neuraminidase.
15. A detoxified pneumococcal neuraminidase or an antigenic portion thereof, wherein the neuraminidase comprises a deletion of at least 20% of the C-terminal amino acids of non-detoxified neuraminidase.
16. A detoxified pneumococcal neuraminidase or an antigenic portion thereof, wherein the neuraminidase comprises a deletion of at least 30% of the C-terminal amino acids of non-detoxified neuraminidase.
17. A detoxified pneumococcal neuraminidase or an antigenic portion thereof, wherein the neuraminidase comprises a deletion of at least 35% of the C-terminal amino acids of non-detoxified neuraminidase.
18. A composition comprising a detoxified pneumococcal neuraminidase or an antigenic portion thereof and a pharmaceutically acceptable carrier.
19. The composition of claim 18, further comprising an adjuvant.
20. A method of generating antibodies specific to pneumococcal neuraminidase in a subject comprising administering to the subject a detoxified pneumococcal neuraminidase or an antigenic portion thereof.

21. A method of reducing pneumococcal nasal carriage in a subject comprising administering to the subject a detoxified pneumococcal neuraminidase or an antigenic portion thereof.
22. A method of preventing pneumococcal infection in a subject comprising administering to the subject a detoxified pneumococcal neuraminidase or an antigenic portion thereof.
23. The method of claim 22 , wherein the pneumococcal infection is meningitis.
24. The method of claim 22 , wherein the pneumococcal infection is otitis media.
25. The method of claim 22 , wherein the pneumococcal infection is pneumonia.
26. The method of claim 22 , wherein the pneumococcal infection is hemolytic uremia.
27. A method of reducing or preventing pneumococcal nasal carriage in a subject comprising administering to the subject a pneumococcal neuraminidase or an antigenic fragment thereof under conditions that reduce or prevent the nasal carriage.
28. A method of reducing or preventing pneumococcal infection in a subject comprising administering to the subject a pneumococcal neuraminidase or an antigenic fragment thereof under conditions that reduce or prevent the infection.
29. The method of claim 28 , wherein the pneumococcal infection is meningitis.
30. The method of claim 28 , wherein the pneumococcal infection is otitis media.
31. The method of claim 28 , wherein the pneumococcal infection is pneumonia.
32. The method of claim 28 , wherein the pneumococcal infection is hemolytic uremia.
33. A method of reducing or preventing pneumococcal infection in a subject comprising administering to the subject a pneumococcal neuraminidase antibody or a fragment thereof under conditions that reduce or prevent the infection, wherein the administration step comprises contacting a mucosal surface of the subject with the antibody.
34. The method of claim 33 , wherein the pneumococcal infection is meningitis.

35. The method of claim 33 , wherein the pneucococcal infection is otitis media.
36. The method of claim 33 , wherein the pneucococcal infection is pneumonia.
37. The method of claim 33 , wherein the pneucococcal infection is hemolytic uremia.
38. A composition comprising a pneumococcal neuraminidase or an antigenic portion thereof and a pharmaceutically acceptable carrier, wherein the composition is suitable for administration to a mucosal surface.
39. The composition of claim 38, wherein the composition is a nasal spray.
40. The composition of claim 38, wherein the composition is a nebulizer solution.
41. The composition of claim 38, wherein the composition is an aerosol inhalant.
42. A container comprising the composition of claim 38.
43. The container of claim 42, wherein the container is a nasal sprayer.
44. The container of claim 42, wherein the container is a nebulizer.
45. The container of claim 42, wherein the container is an inhaler.
46. A method of generating antibodies specific to pneumococcal neuraminidase in a subject comprising contacting the nasal mucosa of the subject with a detoxified pneumococcal neuraminidase or an antigenic portion thereof.
47. A method of reducing pneumococcal nasal carriage in a subject comprising contacting the nasal mucosa of the subject with a detoxified pneumococcal neuraminidase or an antigenic portion thereof.
48. A method of preventing pneumococcal infection in a subject comprising contacting a mucosal surface of the subject with a detoxified pneumococcal neuraminidase or an antigenic portion thereof.
49. The method of claim 48 , wherein the pneucococcal infection is meningitis.
50. The method of claim 48 , wherein the pneucococcal infection is otitis media.
51. The method of claim 48 , wherein the pneucococcal infection is pneumonia.
52. The method of claim 48 , wherein the pneucococcal infection is hemolytic uremia.
53. A composition comprising a phosphocholine or an antigenic portion thereof of pneumococcal teichoic acid or pneumococcal lipoteichoic acid and a

- pharmaceutically acceptable carrier, wherein the composition is suitable for administration to a mucosal surface.
54. The composition of claim 53, wherein the composition is a nasal spray.
  55. The composition of claim 53, wherein the composition is a nebulizer solution.
  56. The composition of claim 53, wherein the composition is an aerosol inhalant.
  57. A container comprising the composition of claim 53.
  58. The container of claim 57, wherein the container is a nasal sprayer.
  59. The container of claim 57, wherein the container is a nebulizer.
  60. The container of claim 57, wherein the container is an inhaler.
  61. A method of generating antibodies specific to pneumococcal neuraminidase in a subject comprising contacting the nasal mucosa of the subject with the composition of claim 53.
  62. A method of reducing pneumococcal nasal carriage in a subject comprising contacting the nasal mucosa of the subject with the composition of claim 53.
  63. A method of reducing or preventing pneumococcal infection in a subject comprising contacting a mucosal surface of the subject with the composition of claim 53.
  64. The method of claim 63 , wherein the pneumococcal infection is meningitis.
  65. The method of claim 63 , wherein the pneumococcal infection is otitis media.
  66. The method of claim 63 , wherein the pneumococcal infection is pneumonia.
  67. The method of claim 63 , wherein the pneumococcal infection is hemolytic uremia.
  68. A composition comprising a pneumococcal neuraminidase or an antigenic portion thereof, a phosphocholine or an antigenic portion thereof of pneumococcal teichoic acid or pneumococcal lipoteichoic acid, and a pharmaceutically acceptable carrier, wherein the composition is suitable for administration to a mucosal surface.
  69. The composition of claim 68, wherein the composition is a nasal spray.
  70. The composition of claim 68, wherein the composition is a nebulizer solution.
  71. The composition of claim 68, wherein the composition is an aerosol inhalant.
  72. A container comprising the composition of claim 68.

73. The container of claim 72, wherein the container is a nasal sprayer.
74. The container of claim 72, wherein the container is a nebulizer.
75. The container of claim 72, wherein the container is an inhaler.
76. A method of generating antibodies specific to pneumococcal neuraminidase in a subject comprising contacting the nasal mucosa of the subject with the composition of claim 68.
77. A method of reducing pneumococcal nasal carriage in a subject comprising contacting the nasal mucosa of the subject with the composition of claim 68.
78. A method of preventing pneumococcal infection in a subject comprising contacting a mucosal surface of the subject with the composition of claim 68.
79. The method of claim 78, wherein the pneumococcal infection is meningitis.
80. The method of claim 78, wherein the pneumococcal infection is otitis media.
81. The method of claim 78, wherein the pneumococcal infection is pneumonia.
82. The method of claim 78, wherein the pneumococcal infection is hemolytic uremia.
83. A composition comprising a non-phosphocholine antigenic portion of pneumococcal teichoic acid or pneumococcal lipoteichoic acid and a pharmaceutically acceptable carrier, wherein the composition is suitable for administration to a mucosal surface.
84. The composition of claim 83, wherein the composition is a nasal spray.
85. The composition of claim 83, wherein the composition is a nebulizer solution.
86. The composition of claim 83, wherein the composition is an aerosol inhalant.
87. A container comprising the composition of claim 83.
88. The container of claim 87, wherein the container is a nasal sprayer.
89. The container of claim 87, wherein the container is a nebulizer.
90. The container of claim 87, wherein the container is an inhaler.
91. A method of generating antibodies specific to pneumococcal neuraminidase in a subject comprising contacting the nasal mucosa of the subject with the composition of claim 83.
92. A method of reducing pneumococcal nasal carriage in a subject comprising contacting the nasal mucosa of the subject with the composition of claim 83.

93. A method of preventing pneumococcal infection in a subject comprising contacting a mucosal surface of the subject with the composition of claim 83.
94. The method of claim 93, wherein the pneumococcal infection is meningitis.
95. The method of claim 93, wherein the pneumococcal infection is otitis media.
96. The method of claim 93, wherein the pneumococcal infection is pneumonia.
97. The method of claim 93, wherein the pneumococcal infection is hemolytic uremia.
98. A composition comprising a pneumococcal neuraminidase or an antigenic portion thereof, a non-phosphocholine antigenic portion of pneumococcal teichoic acid or pneumococcal lipoteichoic acid, and a pharmaceutically acceptable carrier, wherein the composition is suitable for administration to a mucosal surface.
99. The composition of claim 98, wherein the composition is a nasal spray.
100. The composition of claim 98, wherein the composition is a nebulizer solution.
101. The composition of claim 98, wherein the composition is an aerosol inhalant.
102. A container comprising the composition of claim 98.
103. The container of claim 102, wherein the container is a nasal sprayer.
104. The container of claim 102, wherein the container is a nebulizer.
105. The container of claim 102, wherein the container is an inhaler.
106. A method of generating antibodies specific to pneumococcal neuraminidase in a subject comprising contacting the nasal mucosa of the subject with the composition of claim 98.
107. A method of reducing pneumococcal nasal carriage in a subject comprising contacting the nasal mucosa of the subject with the composition of claim 98.
108. A method of preventing pneumococcal infection in a subject comprising contacting a mucosal surface of the subject with the composition of claim 98.
109. The method of claim 108, wherein the pneumococcal infection is meningitis.
110. The method of claim 108, wherein the pneumococcal infection is otitis media.
111. The method of claim 108, wherein the pneumococcal infection is pneumonia.
112. The method of claim 108, wherein the pneumococcal infection is hemolytic uremia.

113. A composition comprising a phosphocholine antibody or a fragment thereof and a pharmaceutically acceptable carrier.
114. The composition of claim 113, wherein the composition is suitable for administration to a mucosal surface.
115. The composition of claim 113, wherein the composition is a nasal spray.
116. The composition of claim 113, wherein the composition is a nebulizer solution.
117. The composition of claim 113, wherein the composition is an aerosol inhalant.
118. A container comprising the composition of claim 113.
119. The container of claim 118, wherein the container is a nasal sprayer.
120. The container of claim 118, wherein the container is a nebulizer.
121. The container of claim 118, wherein the container is an inhaler.
122. A method of reducing pneumococcal nasal carriage in a subject comprising administering to the subject a phosphocholine antibody or a fragment thereof.
123. The method of claim 122, wherein the administration comprising contacting the nasal mucosa of the subject with the antibody or fragment thereof.
124. A method of preventing pneumococcal infection in a subject comprising administering to the subject a phosphocholine antibody or a fragment thereof.
125. The method of claim 124, wherein the administration comprises contacting the nasal mucosa of the subject with the antibody or fragment thereof